Thesis/
Reports
Bailey,
V.

REPORT ON INVESTIGATIONS OF THE ELK HERDS IN THE YELLOWSTONE REGION OF WYOMING, MONTANA AND IDAHO

Vernon Bailey

G
Service, Supervision
Elk Investigations.

December 14, 1915

REPORT ON

INVESTIGATIONS OF THE ELK HERDS

IN THE

YELLOWSTONE REGION OF WYOMING, MONTANA AND IDAHO.

SUBMITTED TO BIOLOGICAL SURVEY AND FOREST SERVICE

DECEMBER 14, 1915

Vernon Bailey
Chief Field Naturalist
BIOLOGICAL SURVEY

Alva G Dunbar
Forest Supervisor,
FOREST SERVICE.

Service, Supervision
Elk Investigations.

December 14, 1915

REPORT ON

INVESTIGATIONS OF THE ELK HERDS

IN THE

YELLOWSTONE REGION OF WYOMING, MONTANA AND IDAHO.

SUBMITTED TO BIOLOGICAL SURVEY AND FOREST SERVICE

DECEMBER 14, 1915

* Vernon Bailey
Chief Field Naturalist
BIOLOGICAL SURVEY

Alva A Simpson
Forest Supervisor,
FOREST SERVICE.

G
Service, Supervision
Elk Investigations.

December 14 1915

REPORT ON
INVESTIGATIONS OF THE ELK HERDS
IN THE
YELLOWSTONE REGION OF WYOMING, MONTANA AND IDAHO.
SUBMITTED TO BIOLOGICAL SURVEY AND FOREST SERVICE
DECEMBER 14, 1915

Vernon Bailey
Chief Field Naturalist
BIOLOGICAL SURVEY

Alva A Simpson
Forest Supervisor,
FOREST SERVICE.

Service, Supervision
Elk Investigations.

December 14, 1915

REPORT ON
INVESTIGATIONS OF THE ELK HERDS
IN THE
YELLOWSTONE REGION OF WYOMING, MONTANA AND IDAHO.
SUBMITTED TO BIOLOGICAL SURVEY AND FOREST SERVICE
DECEMBER 14, 1915

Vernon Bailey
Chief Field Naturalist
BIOLOGICAL SURVEY

Alex. A. Lumsden
Forest Supervisor,
FOREST SERVICE.

INVESTIGATION OF THE ELK HERDS IN THE YELLOWSTONE PARK REGION OF WYOMING, MONTANA, AND IDAHO.

A Joint Report of Investigations carried on by the Forest Service and Biological Survey during the summer of 1915.

Present number and distribution of the elk herds.

The elk in the Yellowstone Park region have been arbitrarily referred to as the Northern, Eastern, and Southern herds, which in winter mainly occupy the Yellowstone River, Shoshone River, Wind River, Green River and Snake River valleys. This is a good winter range division and has come into common use through separate reports from National Forest Districts 1, 2, and 4. In summer the Northern and Southern herds are fully mingled with the Eastern herd. In fact there seems to be free and pretty general drift between the herds from the head of Green River north to and beyond the Montana State line. The more practical division, therefore, seems to be into two main herds, the Northern and Southern. These are partially separated by the Continental Divide west of Yellowstone Lake, the lake itself and the Yellowstone River above where it enters the lake.

The approximate number of elk estimated in the Northern herd by the Yellowstone

---

1 The present report is based on a summer examination of the elk range in Wyoming, Montana, and Idaho, surrounding the Yellowstone National Park, in cooperation between the Forest Service and Biological Survey, the former being represented on the Gallatin and Absaroka forests by Supervisor C. L. Smith, and on the remaining forests by Supervisor Alva A. Simpson, and the latter by Vernon Bailey, Chief Field Naturalist of the Biological Survey. The present report is based on the field reports of these active representatives and such other field reports and reliable information as they could bring together.

Park authorities in April, 1914, was 35,209,[1] and to this should be added 756 head, the northern portion of the Eastern herd, making a total of 35,965 head; and in the Southern herd estimated by officials of the Forest Service in 1912 and 1915 as approximately 20,980.[2] At best these estimates are inaccurate and in many cases it is impossible to tell just how many belong to one herd or if the same animals are included in estimates of different herds. As nearly as can be ascertained, the subdivisions of the herds are, at the present time, or at the last reliable estimates, about as follows:

Distribution of Elk--Northern Herd.

Locality	Year	Winter	Summer
Madison Range, Montana.	1915	1,200	600
West Gallatin Valley, Montana.	"	5,000	
Gallatin Range, Wyoming and Montana.	"		8,000
Yellowstone and Lamar River valleys, Wyoming and Montana.	"	27,800	
Mount Washburn, Wyoming.	"		1,000
Head of Lamar River, Wyoming.	"		700
Mirror Plateau, Wyoming.	"		18,805
Central Plateau, "	"		4,000
Scattered in Yellowstone Park.	"	300	300
Clarks Fork, Wyoming.	"	500	200
North Fork Shoshone) and Wapiti Creek), Wyoming.	"	1,000	195
South Fork Shoshone, "	"	80	80
Thorofare Creek, Wyoming.	"		2,000
Grey Bull, Wyoming.	"	85	85
	Totals,	35,965	35,965

1 Report Acting Superintendent of Yellowstone National Park for 1914, p. 14.
2 Count of Forest Service, 1912, on Jackson Hole herd; 1915 annual estimate of Forest Service on Green, Wind and Shoshone rivers.

Distribution of Elk--Southern Herd.

Locality	Year	Winter	Summer
Snake River near Park Line.	1915	50	
Thorofare and Upper Yellowstone valleys, Wyoming.	"	100	
Moran, Wyoming.	"	300	
Pacific Creek, Wyoming.	"	200	
Buffalo Creek, "	"	300	
" 1st Ridge South, Wyoming.	"	200	
" 2nd " " "	"	300	
Upper Gros Ventre, Wyoming.	"	1,500	
Middle " " "	"	1,500	
Lower " " "	"	1,000	
ry Hollow, Wyoming.	"	1,500	
Jackson Hole, "	"	7,350	
Cheney, Wyoming.	1912	1,000	
Game Creek, "	"	300	
Porcupine Creek, Wyoming.	"	300	
Horse Creek, "	"	500	
Hoback (below Canyon), Wyoming.	"	1,000	
Raspberry Ridge, Wyoming.	"	100	
Martin Creek, Wyoming.	"	500	
Cliff Creek, "	1915		1,000
Willow Creek, "	"		500
Snake River Mountains, Wyoming.	"		500
Gros Ventre Range, Wyoming.	"		2,000
ount Leidy region, "	"		3,000
Teton State Game Preserve, Wyoming.	"		7,000
Yellowstone Park, south of Lake.	"		4,000

Locality	Year	Winter	Summer
Yellowstone Park, Bechler River.	1915		200
Green River,-lake region, Wyoming.	"	1,700	1,700
Fremont Lake, Wyoming.	"	180	180
Sweetwater, "	"	40	40
Maxwell Basin, "	"	35	35
Spring Mountain, Wyoming.	"	300	300
Jackeys Fork, "	"	75	75
Warm Spring Creek, "	"	100	100
Wind River--Long Creek, Wyoming.	"	300	
Brooks Lake, Wyoming.	"		300
Targhee Forest, Warm River, Idaho.	"	200	
		Totals,20,930	20,930

For the present it is necessary to accept these figures as a working basis, but it is essential, to any practical plan of future protection and administration of the elk, that a more accurate and reliable census of their numbers be taken. This census, to be most effective, should be cooperative between Forest Service, Biological Survey, and Yellowstone Park authorities and should be well organized to insure thorough covering of the winter ranges at the same time and without duplication. If well organized it could probably be completed in about a month and should be begun about February or March of a normal season, or immediately after a severe storm in the latter part of the winter when the elk are massed at the lowest levels. This census should be continued each succeeding year for comparative purposes.

The past two winters have been unusually mild and the elk have not come down into the low valleys in great numbers, while many have wintered in scattered localities throughout the mountains, so that reliable estimates of their numbers were especially difficult. It is therefore an open question whether they are increasing or decreasing. A steady increase in numbers has generally been assumed, but from

vidence gathered during the past season a decrease seems more probable. If the coming winter brings deep snows, the opportunity for a reliable census will be especially favorable.

The maximum herd to be permanently maintained can, however, be decided on the basis of available range and relative value of stock and game to the State. Then the approximate increase less the non-preventable loss will give the number that can be killed or distributed by shipments throughout the country.

Range of the Elk.

Winter Range

Before the country became settled the elk habitually left the high mountain country before the autumn storms and came down into warm valleys where they wintered in comparative comfort. At the present time most of these warm valleys are occupied by ranches, and the feed is all needed for domestic stock. The elk, however, have several advantages over domestic stock in being able to feed on slopes that are very steep and rough and, also, in having a wider range of food plants, including a great variety of browse, which horses and cattle do not eat. They are more hardy and adapt themselves to higher, colder valleys than those where stock can be safely wintered, and are able to paw through considerable snow to get at the grass and plants beneath. For these reasons, except in severe winters, the elk are now wintering in comparative safety in such valleys as those indicated above. The Yellowstone Valley, in the northern part of the Park, is a good typical winter range for elk in which they do well with very little loss, even in severe winters. This open valley from Gardiner to Mammoth Hot Springs and Tower Falls and thence up Lamar River and Soda Butte and Slough creeks as far as the open valleys extend, affords an area of approximately 65,000 acres that winters, if present estimates are reliable, over 27,000 elk. This is semiarid Transition Zone lying below the edges of the coniferous forests. It is mainly sagebrush and grass-covered valleys, ridges and warm slopes,

rying in altitude from 5800 feet at Gardiner to 7500 feet on warm exposures. Most of the area yields an abundance of excellent grazing grasses and there are extensive willow bottoms and numerous brushy gulches which afford excellent winter food. The willows and various shrubs show evidence of much browsing during past winters, but the range is not overstocked and would probably provide food for considerably more elk in an ordinary winter than it at present carries. It is practically free from domestic stock, lying almost entirely within the Yellowstone National Park. The area outside of the Park presents special problems to be discussed later.

The West Gallatin Valley winters about 5000 elk, mostly below the Park line, and all except a few hundred individuals summer in the Yellowstone Park. In mild winters a good many elk stay along the open river valley within the borders of the Park, but in severe winters many are driven down the valley as far as the mouth of Porcupine Creek, about 25 miles below the boundary. The valley is long and narrow with many steep slopes facing the south, on which the snow does not usually lie for any great length of time. On these wind-swept slopes the elk find plenty of grass and browse to carry them through the deep snows and come down onto the lower slopes and willow covered flats as the snow recedes. There is very little stock grazing in these valleys at the present time until the lower basin is reached near the mouth of Porcupine Creek, and even here the steep slopes afford considerable good grazing for elk that has not and never will be utilized by other stock. The warm slopes of Monument, Tepee, Sage, Dodge, and Buffalohorn creeks, tributary to this valley, are all good elk winter range and it is only in extreme winters that the elk go down through the canyon to the lower basin. The open part of the valley is all in Transition Zone below 7000 feet on cold slopes and 7500 feet on warm slopes. It is semiarid with normally a light snowfall and mild winters. It approximates 20,000 acres, all National Forest except such lands as have been taken up for ranches, mining claims, or railroad land grants. The upper part of the valley is largely held under

atented claims and a mining company holding these is anxious that the elk should be protected and the officers of the company have expressed a willingness to have their lands included within any game preserve that is established. The settlers are all there for the purpose of keeping hunters and taking out hunting parties during the open season, and are vitally interested in the protection of the game. The land is not adapted to agriculture anywhere above the Lower Basin and only hay and a little bald barley is now raised for the horses and a few cows of the scattered residents. No more than the present number of stock should be allowed on this very important winter range of the elk. Eventually this narrow, picturesque valley will be a popular automobile entrance to the Yellowstone Park and the delightful camp sites along the river will be in constant use during the summer months. The valley certainly has a far greater value for game, fish, and recreational use than for any other purpose.

Along the east slope of the Yellowstone Park four long, narrow valleys reach down between mountain ranges into the Big Horn Basin along Clark's Fork and Sunlight Creek and along the North Fork and South Fork of Shoshone River. These are exceptionally warm and well sheltered valleys, and while not very extensive in area they afford a great amount of rough country, which is ideal winter range for elk and so rough and steep that most of it is not adapted to the use of domestic stock. The valleys reach down to about 6000 feet before opening out into the basin and are so mild that a large number of Upper Sonoran plants are found scattered well up on their warm slopes. In most places they have densely brushy bottoms, open timbered and sagebrush benches with numerous gulches on the side slopes that are filled with brush and good browse. The character of the food is, therefore, well adapted to maintaining a considerable number of elk through the most severe winters. The Shoshone State Game Preserve lies between the north and south forks of Shoshone River within the Shoshone National Forest and includes a considerable part of the best winter range, but should include all of it. Some years early storms bring elk

own during the open season and often it is not possible to protect them from hunters on their wintering ground. At present none of these valleys are wintering half the number of elk that they should. The Thorofare Creek Valley has remained opened to hunting, and it would seem that hunting elk on the west slope would drive them across the range so they would winter on the east slope, but this result has not been attained.

The main part of the southern herd winters in the big, open valley known as Jackson's Hole. In severe winters the great mass of elk drift down to the vicinity of Jackson, but some always remain along the Gros Ventre River and Buffalo Creek, and others extend into the lower Snake River Valley, while in mild winters the greater number remain along these and other higher side valleys in that region.

Jackson's Hole, or Jackson Valley, is a great inland basin lying between the Teton and Gros Ventre Mountains and extending about 50 miles north and south, with an average width of about ten miles. The southern, or lower end, is about 6000 feet above sea-level and the northern end, north of Jackson's Lake, about 7000 feet. Long, narrow valleys extend laterally to the eastward up Hoback River, Gros Ventre River, Spread, Buffalo and Pacific creeks. The open valleys and the warm slopes of these side streams lie within Transition Zone, and at the lower end of the valley there is a strong trace of Upper Sonoran species on warm slopes, indicating a comparatively mild climate. A great deal of the valley is covered with sagebrush and practically all is excellent grazing land. About 9000 cattle and horses are raised in the valley, the number being limited by the amount of hay that can be produced for wintering them; consequently the available summer cattle range is not all utilized. These cattle and horses mostly range in the mountains in midsummer, and graze the lower valleys in the early spring and late fall. In mild winters the elk find an abundance of food over the warm slopes of the valley borders, but in severe winters the feed is often covered by deep snow or sheets of ice, and it is necessary to provide hay to prevent the elk from starving in large numbers. Emergency winters of this

haracter are now being met by the Biological Survey elk ranch near the town of Jackson, where about 1000 tons of hay are stacked in readiness for feeding the elk in case of need. The great mass of elk come down into this valley from the southern border of the Yellowstone Park and the mountains about the headwaters of Pacific and Buffalo creeks, within the Teton State Game Preserve. They come through the mountains east of the valley and along its eastern border and concentrate in the big swamp north of Jackson. Smaller numbers usually continue to the lower valley of the Hoback River or remain along the Gros Ventre River and Buffalo Creek.

On the headwaters of Green River a band of about 1700 elk usually winters on the warm slopes below Green River Lake. The valley widens out below the Lake and extensive slopes, facing toward the southwest, extend for five or six miles along the north side of the river. This is a very dry and rather warm valley with comparatively light snowfall. It has open sagebrush slopes with numerous gulches and willow and aspen thickets and an abundance of grass and browse. The elk are said to always do well in this area and there is no evidence of any considerable number having died during the past few years. A number of shed horns were noticed in this valley, and a few old bones of elk, in most cases very old animals. These elk spend the summer in the adjoining mountains, east and west of the Green River Lakes.

On the head of Wind River the estimates indicate about 700 elk wintering above Dubois and up the river as far as Sheridan Creek. These winter on or near the lower borders of the National Forest, usually on warm slopes or in willow bottoms where the snow is not too deep and there is an abundance of feed. A few ranches scattered along the bottom of the Wind River Valley tend to keep the elk back in the foothills or on the lower slopes of the mountains where they have an abundance of good winter range. Several times the present number could winter in this valley without any shortage of food. These elk summer mainly in the mountains around the head of Wind River.

Two comparatively small herds of elk live in the southern part of the Wind River

ountains on the branches of Popo Agie Creek, south of Lander, and on the head of the Sweetwater. These range in the mountains in summer and go down into the valleys in winter low enough to find good feed and comfortable winter climate. The latest estimates of these herds give about 85 animals in the Maxwell Basin Herd and 40 in the Sweetwater Herd, and a State game preserve has been created for their protection. There is an abundance of rough, unused summer range for them, but the winter range is somewhat limited and they may have to come down among the ranches, at times, to keep below the level of deep snows. As the valley is largely occupied by stock ranches, it would not be advisable to greatly increase these herds, but 300 to 500 animals could be safely carried here without interfering with stock range or any local interest.

The winter range is distributed in many valleys in widely separated parts of different States, but the condition are so similar that they can be considered collectively. The areas where elk winter are practically all in open Transition Zone valleys and generally on warm slopes with semiarid climate and light snowfall. The vegetation is generally characterized by sagebrush and its accompanying set of plants. The grasses are largely of the best range varieties, such as Stipa, Panicum, Festuca, Agropyron, Elymus, Oryzopis, Poa, Tricetum, Bromus, Calamagrostis, Descampsia, Danthonia. Most of these grasses dry up and retain their food value during the winter, so they are peculiarly adapted to winter grazing, even where they are reached by pawing away the snow. The shrubby vegetation also retains in bark and buds a high food value for the winter season and in cases of heavy snows the elk can subsist for a time on the bark of trees and shrubs and twigs of spruce, fir and pine from the thickets and groves. On steep slopes the elk find the least snow and the best grasses, as well as numerous shrubs. They seem to delight in the steepest, roughest slopes where cattle and horses will not go and where they not only find good food, but are undisturbed. On areas grazed by domestic sheep they find little remaining forage except the browse from trees and tall shrubs at a higher level than the sheep

n reach.

Summer Range

As soon as the snow begins to disappear in spring areas of ungrazed grass are exposed at higher levels than where the elk have wintered. These are followed up and the elk work back toward the mountains, usually as fast as the ground becomes bare. During the spring they find the intermediate ridges a favorite pasture and on these half way slopes the great abundance of shed horns are found. By the middle of June or the first of July the snow has disappeared from the warm slopes high into the mountains and grass and vegetation are becoming abundant; also the flies and mosquitoes are becoming troublesome and the elk resort to the tops of the highest ridges in the vicinity of timber line. During the months of July and August the greater numbers of elk are found at and above timber line in the various high ranges the Yellowstone Park and those lying east and south of the Park boundaries. At this time bands of a dozen to a hundred are seen scattered over the great slopes grazing on the fresh spring grasses, drinking at the numerous springs and streamlets or tramping over the great banks of snow which lie on the cold slopes throughout the summer. Cool winds sweep the troublesome insects away and keep them at lower levels while the elk revel in the cool, fresh air and abundant food of the Hudsonian Zone. On July 20 from the top of Quadrant Mountain in the Gallatin Range of the northwestern part of the Yellowstone Park one herd of about 500 elk gathered from the scattered bunches as a large bear passed by and alarmed them into the desire for mutual protection. These had been previously scattered in bands of 20 to 75 over several miles of the open plateau, above timber line. From the same point where this herd was being watched other herds on neighboring ridges and slopes of the range could be counted with a field glass. Herds of 66, 72, 84, 19, 12, and a few scattering individuals were seen. This merely gives an idea of the number seen from one point at one time in the best of the elk summer range. Most of these bunches of elk were

tween 9000 and 10,000 feet altitude and practically all in Hudsonian Zone. In the valley below, well-worn elk trails crossed Fawn Creek from one mountain range to another, but there were no elk ranging in the valley at that time where we camped at 8500 feet. In other places, however, we found a few scattered elk down in the timber and even down to the edge of the valleys where salt licks had attracted them or where they had been driven by some disturbing element above. When frightened on the peaks they usually ran for the timber below and often down across some valley and up into another range. In the high mountains east of Yellowstone Lake there were many elk on the pine ridges below timber line during early August, and also a large number in the parks and meadows lower down. Late in August there were still numerous herds above timber line on the Two Ocean Plateau and Big Game Ridge in the southeastern part of the Park, but by the 12th of September all of the higher mountains were covered with fresh snow and the elk were down in the open timbered areas of the Park and surrounding mountains. The high summer range is, therefore, but of a brief duration of two or three months, and the normal winter range is equally of brief duration, in the severest of the season, in the low valleys. The migration to and from these extremes are usually slow and scattered and include about a half year of more or less irregular wandering, much of which could be included in either summer or winter range, although it presents no problem, except in free trailing. An estimate of the numbers of elk in the different areas of their summer range is in most cases difficult and uncertain, as they are constantly changing and can never be counted in more than scattered fragments.

The summer range of elk, both in and around the Yellowstone Park is fortunately ample, not only for the present herds, but for many times their number: Certainly 100,000 elk could summer comfortably in the Yellowstone Park and as many more outside ward the south and east. Even where they were most numerous and the ground well tramped by their footprints, the grass and native plants were full of flowers and

ods and showed almost no signs of grazing. In a few spots on Big Game Ridge, the Two Ocean Plateau, and Cliff Creek the elk herds had remained long enough in the same locality to make some impression on the amount of grass, but in no place was one-half of the forage utilized. The midsummer grazing for elk at high altitudes is rarely, if ever, adapted to the use of cattle or horses, but in many places it would make excellent summer range for domestic sheep. In fact, the summer use of a range, by elk, rarely interferes with the use of the range by cattle and horses. In summer their food seems to be largely grasses and many varities of herbaceous vegetation. In places they had been eating the mountain maple, Acer glabrum, and leaves and twigs of some other shrubs, but the wild mountain grasses, including native timothy and many other species, the little mountain clovers and numerous other plants seem to be grazed without much choice of species.

On the Shoshone, Teton, Bridger and Bonneville Forests it is estimated that there are approximately 1,600,000 acres of summer range, entirely available for elk, and approximately 2,882,000 acres of range only partially used by cattle and horses. To this should be added the 3500 square miles of the Yellowstone National Park that no stock, except transients, are allowed upon. It is true that these apparently large acreages contain extensive timbered and barren areas, but the habits of the elk fit in ideally with the range conditions and practically all of the range contributes to their summer food. There is obviously no conflict with domestic stock in summer range except toward the edges where sheep have encroached.

Migrations

Even in the plains country elk have always been noted for their extensive migrations, but in the mountainous country, to which they are now mainly restricted, their biennial migrations are as regular and systematic as those of the migratory birds. If the animals were undisturbed their migrations would doubtless follow definite lines with very little variation, but by the pursuit of hunters and natural

anies the herds are often driven back and forth between their summer and winter ranges and many different routes are taken. The winter range, being most restricted, is the main determining factor and well-worn trails lead back from these areas to the higher country where the summer range lies. In some cases the migrations extend for 50 or 100 miles, but in other localities the winter and summer ranges lie close together and the migrations are merely up and down the steep slopes of the mountains. Elk which summer in the southern part of the Yellowstone Park move southward to the vicinity of Jackson during hard winters, covering probably 100 miles by their somewhat indirect trails. Others in the Wind River and Absaroka Mountains move in places not over ten miles between their winter and summer grounds. It is generally assumed that each elk goes back to the same ground every winter, but it seems much more probable that they go with the bulk of the herd they happen to be with at the time, and it is well known that elk are constantly being scattered from one range to another by disturbing influences during the summer season and especially by the pursuit of hunters during the open season on unprotected areas. In passing through the central part of the Yellowstone Park from south to north, September 14 to 16, 1915, we found an abundance of elk tracks in the snow throughout the plateau country west of Yellowstone Lake. Small herds and scattering individuals were drifting through this country in all directions at that time, just after a heavy snow had driven them down from the higher ranges. Many were crossing the Yellowstone River between the lake and canyon, heading westward, and apparently some of them passed south along the western side of the lake and others drifted northward toward the Gardiner region. During the latter part of August numerous fresh tracks and well used trails were seen crossing the upper Yellowstone River, above the lake, where elk were evidently passing to and fro between the Two Ocean Plateau and the Absaroka range in the neighborhood of Thorofare Creek. On which slope the elk happen to be when the first heavy snow comes is probably the determining factor as to whether they shall winter in the region about Gardiner or in Jackson's Hole or the Big Horn

sin. In the same way with those on the Gallatin Range in the northwestern part of the Park the slope on which they are caught by the first storm probably determines whether they winter in the Gallatin Valley in Montana or the Gardiner Valley within the Park. A few years ago the winter range also included warm valleys in Idaho along the western side of the Yellowstone Park, but owing to lack of protection the elk have been almost entirely destroyed or forced to abandon these winter grounds. It is now a well established fact that if an elk gets into Idaho at any season of the year he will rarely return to a protected area, thus the migration of elk becomes an interstate problem of considerable magnitude, and much of the hitherto destruction of this splendid game animal has been due to lack of uniformity and enforcement of the laws of the States bordering the Yellowstone Park. There are very few elk in most of the western part of the Yellowstone Park at the present time, simply because they have not been given protection in the adjoining country outside of the Park. If the same conditions prevailed on the south and east of the Park the elk herds would be reduced to such a limited number that their extermination would probably be but a question of time. Both winter and summer range are being fast crowded out of the State of Montana, and when they are restricted to the Park on both the west and north the ultimate fate of the elk herds will depend entirely on the State laws of Wyoming. It is doubtful if the area within the Yellowstone Park alone can permanently maintain sufficient elk to insure protection from extermination.

HABITS.

Food

In summer the food of elk consists largely of grasses and a great variety of herbaceous plants, but also includes some leaves and buds and twigs of shrubs. Evidently they do not require the bulk of food that cattle consume on the summer range or a greater effect would be noticed on the vegetation where they graze. With their more delicate noses they evidently select the choice bits and seed-laden tops

plants which prove richer food than the body of the grass, which is the main food of the cattle. The fact that elk keep in good condition during the summer, while the adult females are nursing calves and the bulls are producing an enormous horn growth, indicates a rich and ample food supply. In winter the nature of their food changes to dry grasses of the valley species and a great variety of shrubs and browse. Willows of many species are an abundant source of food supply along many of the valley streams and meadows. Wherever they occur on the wintering grounds the willows are trimmed off to mere stumps during the winter. This only increases the number of small twigs sent out during the next summer and the twigs furnish the favorite food of the elk when snows have covered the lower vegetation or rendered it difficult to get at. In times of deep snow and heavy crust it is often impossible for the animals to get to the ground, and their only salvation is shrubs and trees which stand up within reach. Mountain maple, service berry, wild rose, snow-berry, fly honeysuckle, and many other shrubs are eaten during the winter. If there is an abundance of food merely the buds and tips of twigs are taken, but in case of scarcity the stems are eaten down to mere stumps. In places the bark is peeled from aspens to such an extent that whole groves of the small trees are killed, but this seems to be one of the last resorts in time of deep snows and scarcity of food. In places also the twigs and small branches of Douglas spruce, Englemann spruce, Alpine fir, and lodgepole pine are also trimmed up as high as the elk can reach during deep snows.

Originally the elk moved to lower levels when the weather became too severe for them on their regular winter range, but since the lower country has been settled and fenced they are often restricted to areas where food is at times deeply buried. For this reason it has become necessary to provide an emergency supply of hay for them in Jackson's Hole on one of their main wintering grounds. They gather into the valleys and eagerly follow the wagons and pick up the scattered hay, thankful to get any kind or quality.

They show great fondness for salt and travel long distances in summer to reach

rtain springs which are generally alkaline and very slightly impregnated with saline matter. In many cases these are the worst type of mudholes and afford only a slight seepage of their murky water, but the elk seem to revel in that and in many cases even wallow in the mud. Some of these springs, which are very much frequented by the elk, seem to be more alkaline than saline, and to the human taste have no decided flavor of salt even in the white deposits left on the drying mud. These springs are commonly called elk licks as the elk in their eagerness for the salt lick the surface of the drying earth or nibble off the whitened incrustations until they often make extensive excavations into the banks surrounding the spring. This habit would suggest the possibility of partially controlling the summer habitat of the animals by providing salt grounds, just as range cattle are kept contented on any part of their range by salting proper areas. There is some question as to whether the elk merely crave salt or whether it is phosphates or other bone-producing minerals which they feel the need of. The habit of eating the shed horns seems to be very general among them, not only in zoological parks, but on their native range. Many of the horns found lying on the ground have part or all of the prongs eaten off by the elk during spring and early summer. In some cases small horns are almost entirely eaten up by the elk and only gnawed stumps remain. The prints of the elk's teeth on these gnawed horns are very characteristic and can not be mistaken for the tooth marks of rodents, which also gnaw many of the horns, but in quite a different manner.

Horns

To many people it is quite incomprehensible that the enormous antlers of a bull elk should be shed and renewed each year, and the wonder increases as one rides over the undisturbed range in July where hundreds of scattered horns have dropped along the trail up to where the herds of old bulls are already supplied with full-grown antlers covered with beautiful soft brown velvet. On July 20 a large number of old

lls on top of Quadrant Mountain showed full size antlers, but the young bulls and spikes were still with short, club-shaped and usually about half-grown sets. On August 19 on the Big Game Ridge in the southern part of the park a few of the largest bulls showed white points to the horns where the velvet had fallen away or been rubbed off against the trees. On the same date a few freshly rubbed trees were seen, the first of the season, where the bark had been rubbed off and the fresh pitch was just starting to flow. In the mountains south of Jackson, on September 2 and 5, old bulls were seen with fully peeled and smooth, well rubbed horns and they were beginning to bugle for the rutting season. Thus the complete transformation of the dropping away of old horns in March and April, the rapid growth from the budding base through heavy beam and long fur-clad prongs, the hardening and peeling process, to the perfect antlers takes place in about five months. The horns are of active use mainly during the rutting season in September and October. First they are thoroughly rubbed and polished on the trunks of small trees, and incidentally a great many trees are girdled and killed in the process. Then the fighting for supremacy in the herds begins and the most vigorous bulls drive out the younger and less valiant, and each champion defends his harems of cows, not so much against outside enemies as against breeding from inferior stock.

Breeding

The rutting season begins early in September and lasts through October. At this time the elk are mainly scattered through the timber, the bulls running frantically in search of cows or vigorously defending the bunches which they have collected. The musical note of their bugling is heard along the mountain sides. The calves are born in May and June, the period of gestation being approximately 8 1/2 months. At the time when the calves are born the elk are about half way between their winter and summer ranges, usually scattered over the open ridges and in forest parks where new grass is abundant and the conditions are favorable, except for the numerous

emies which prey upon the young calves. At the age of a few days, according to Judge Caton, a few weeks, according to other authors, the calves begin to follow their parents and soon join the small herds that are gathering on the summer range. In July the herds are mixed from all ages, from the calves to old cows and bulls. Normally but one calf is born to a cow, and unfortunately a large percentage of these never reach maturity. The calves are weaned in the late fall or early winter and the hunters claim that during the open season, especially in September, the cows killed for meat are usually still nursing their calves. They also claim that a motherless calf will seldom last through the winter.

Bugling and call notes

Among the various sounds made by the elk the bugling of the bulls during the rutting season is the best known and most conspicuous. It is a call or challenge note, and when two bulls on opposite slopes are answering back and forth with their long, high-pitched, quavering, flute-like note, ending in guttural grunts, it is quite inspiring and seems well named. We first heard their bugling on September 5, and it was occasionally heard through the mountains as long as we were among the elk, or up to September 16. It lasts throughout the rutting season but is not heard during the rest of the year. The bugling is most active early in the morning, but may be heard at any time of day or night where the bulls are running. In places where the animals are much hunted bugling is now rarely heard, but in the larger bands that have remained undisturbed, it is very common. The cow elk have a barking note, a short gruff snort, used very commonly as a warning in case of danger. This is evidently used mainly in summer and early fall when the calves are with the herds and the cows are anxious for the welfare of their young. The calves and young elk also have a whistling note which is often conspicuous if one approaches a mixed herd. In large herds the sound is at times almost continuous, so many of the animals are repeating it at short intervals. This note is generally credited to the calves,

t there is some difficulty in determining whether it is made by any of the older animals, also, as one is rarely close enough to the animals to distinguish from which individuals the sounds come.

DISEASES OF ELK.

"Scabby Bulls"

In general, the elk are exceptionally healthy animals, but hunters all speak of "scabby bulls" which are occasionally seen during the hunting season or winter months. These are usually very poor and evidently sick, with rough coats and patches of scabby, diseased skin about the head and over the body. None of the hunters or rachhmen, who are familiar with the disease, have seen it in any except the old bulls. "Scabby bulls" are usually shot and left in the woods wherever they are found, on the theory that this will prevent further contagion, if it is a contagious disease. This disease should undoubtedly be further investigated by the Bureau of Animal Industry.

Ticks

In the spring, winter ticks or elk ticks are exceptionally numerous in much of the elk country. In both Jackson's Hole and the region about Gardiner the accounts of their abundance on the elk are astonishing. In case of elk which fared badly through the winter and are weak and greatly emaciated in spring the ticks are said to often almost cover the animals and become engorged until they form a closely shingled mass over the bodies of the elk. In some cases the elk die in this condition, evidently in part from this added drain on an already greatly weakened system. Even the carcasses of elk which have died in the winter are said to be often covered with engorged ticks which have gathered on them during the first warm weather of spring. The extent of injury from ticks is not well known, but may be more serious than is supposed. Specimens of the ticks have been sent to the Bureau

Entomology and identified as Dermacentor albipictus.[1] Fortunately they are not the species responsible for the spread of spotted or mountain fever, but ticks of any kind suggest lurking dangers. Some of the elk shipped for introduction on National forests and game preserves in other States have been thoroughly dipped to insure their freedom from ticks or any skin disease. This would seem a wise precaution to be taken in all such cases.

1/ Biology of North American Ticks of the Genus Dermacentor, by F. C. Bishop and H. P. Wood, Parasitology, Vol. VI, No. 2, p. 161-178, 1913.

LOSSES.

In order to determine the relation of losses to the maximum herd and available numbers to be killed or diffused, this subject has been divided into two general heads--non-preventable loss, including all losses that can not be overcome, and preventable loss, including all losses that can be wholly or partially overcome.

Non-Preventable Loss

Losses under this head can be attributed to old age, accidents, and death from wounds, although the third condition can perhaps be remedied.

Old Age: A small but certain loss that varies with the severity of the winter occurs each year from old age, and this can not be effectively controlled when the elk are in their present wild condition. Old age is shown by the worn down teeth of many skulls found on the winter range, indicating that the loss occurred from inability to properly masticate the winter food. Care in choosing for game the older bulls and cows as indicated by size of head and general appearance would, to a certain extent, minimize the loss from this cause, but would not entirely prevent it.

Accidents: The habit of seeking steep sidehills often causes a number of elk to be lost from snowslides and avalanches. One often sees the bodies of elk,

intermingled with the snow and debris after one of these slides. This loss varies with the climatic conditions, but is uncontrollable and one to be reckoned with in detailed plans.

Wounds: A great many elk are wounded in the autumn hunting and being weakened by loss of vitality, die during the winter period. To this class should be added the calves that are lost through the killing of their mothers. This loss can be minimized by the issuance of licenses to responsible hunters only, and by general restriction of killing to the males and barren cows.

Preventable Loss

Starvation: Actual starvation is almost wholly preventable, even in abnormal winters, but it is doubtful if this condition can be realized until the habits of the elk are better known and relief is systematically provided. As early as 1897, before practically any settlement in Jackson Hole, the loss from winter starvation was proportionately as great as during the winters of 1909-10 and 1910-11. The theory that settlement of the valleys has caused the losses from starvation in recent years does not entirely hold true in this case, although it undoubtedly contributes to recent losses, and will continue to do so if no measures are taken to provide winter refuges. Two conditions have been largely responsible for the starvation losses. First, the habit of the elk to congregate in a comparatively small space in the main Jackson Hole Valley, and, secondly, the frequent isolation of the calves from the herds of mature elk during the early winter period, with the result that herds of calves are often so weakened by being caught in severe storms, that before they reach suitable range, or succor from feeding, a large loss occurs. In 1897 many elk teeth were collected after the big loss from starvation and it is now believed that this indicates a far greater loss among mature animals than has occurred in recent years and that the winter conditions of 1897 were harder than the elk have suffered since. Deep snow is not the only cause of loss; early thaws fol-

owed by freezing weather coats the ground with ice and prevents the elk from uncovering the feed. To minimize the loss from starvation, it is recommended that suitable elk winter range be set aside along the Gros Ventre, Hoback and other low valleys within the National Forest, based upon a winter examination. It is also recommended that the Biological Survey supplement their Jackson Hay Ranch by small stores of hay in the outlying winter range valleys where quick relief can be given the smaller herds in case of emergency. This could be effected by withdrawing for administrative use certain cultivable areas of National Forest land that is now available, or by the purchase of small stores of hay, to be delivered in the required locality.

To relieve the second condition of stranded calves it will be necessary for the representatives of the protective forces to anticipate their isolation and drive or force them toward the centralized supplies of hay.

Predatory Animals

Wolves: Wolves perhaps cause the greatest loss from any single source. In early days the wolf was unknown in Jackson Hole. The first depredations from wolves occurred in about 1900, and have been gradually increasing until today wolves are a menace to both game and stock and their death commands an enormous bounty. Twenty years ago the wolves were numerous on the Green River and Wind River slopes, but encroaching settlements and hunting has forced them to congregate in the Jackson Hole Region until their numbers have become alarming. In 1914 local hunters killed 38 wolves in the Jackson Hole Region, and when the loss in game and stock caused by one wolf is considered, the seriousness of the wolf problem is apparent. The conspicuously small elk calf crop over extensive areas this year is undoubtedly due to wolves and coyotes. It is strongly recommended that the Biological Survey continue their campaign in this region without abatement until these pests are greatly

educed in numbers. Recently the State of Wyoming has placed two trappers in the Jackson Hole Region for the primary purpose of game protection.

Coyotes: Loss from coyotes is mainly confined to young calves in spring and to those weakened by starvation in winter. It is a serious loss but can be handled in connection with the destruction of wolves by the Government hunters and trappers as far as agency of man can handle it. Coyotes will never be entirely exterminated in this mountain region, but their numbers can be so reduced that damage from that source will be negligible.

Mountain Lions: The campaign against mountain lions waged some 10 years ago almost exterminated these animals from the Yellowstone Region. They are gradually increasing again, however, since the restriction of the State Game Law that prohibits the use of dogs for hunting within the National Forests of Wyoming. The restriction was effected to prevent game from being frightened, but moderate use of dogs, if properly controlled, would save a serious loss in both elk and deer. It is well known that mountain lions cause almost untold loss among game animals, and that they are most successfully hunted by the aid of well trained dogs. It is recommended that this feature of the Wyoming State Law be replaced by a section allowing responsible men or Government trappers to hunt with dogs, under special permit.

Hunting

Loss from hunting can be readily divided into three classes: Recreative hunting, meat hunting, and illegal hunting.

Recreative Hunting: Recreative hunting is engaged in mainly by the better class of resident and non-resident hunters, who combine a desire for securing a trophy with a desire for outdoor sport and recreation. It is the highest use to which our wild game can be put, since it produces an income to the community and provides an incentive to an inspiring type of recreation. Unfortunately, such hunting is, under present

nditions, expensive and can be engaged in only by those who can afford to spend time and money. In 1913, 139 fifty-dollar licenses were issued to non-residents in Wyoming who killed perhaps 200 head of elk under the law, allowing two elk to a license. In 1914, 109 non-resident licenses were issued, indicating a general decrease of hunters. This is comparatively a small number and there is offered a field for considerable study in determining how best to facilitate this character of hunting among more people. The many restrictions placed around the non-resident hunter by the State laws will prevent unlimited enjoyment of hunting privileges until game animals are handled on an income and recreation producing basis, and final solution of this problem may well await other and more important changes.

Meat Hunting: It has long been the practice of the local people to depend upon the elk herd for their supply of meat. Families of sometimes eight or ten members secure licenses at $2.50 each in Wyoming and $1.00 each in Montana and Idaho and go to the hills for their winter's supply. Often it is unnecessary for them to go farther than the elk winter range where wagons can be drawn to the point of killing. Wagon loads of meat, dependent upon the size of the family or number of the hired men that have secured licenses, are brought back to the ranches and fresh elk meat is a steady diet for the next five months, and often a supply is salted or dried for the entire year. Considering the actual meat value of an elk if placed upon an epicurean market, one realizes the appalling waste of the State's resources. At present, however, meat hunting seems to provide the only feasible method of killing off the surplus elk, and also assists locally in the problem of meat supply. Although under private management this surplus would be placed upon the market and would bring a high return in dollars and cents, it is practically impossible to commercialize the elk under State ownership, except through licenses and the returns of legalized hunting. Two restrictions seem necessary that two great evils can be overcome. The resident license fee should be more nearly in accord with the actual meat value of

he animal and the necessary power should be placed in the hands of the State Game Commission for the arbitrary closing of the hunting season. The first restriction would to a large extent prevent purchase of licenses by irresponsible and immature hunters and would cause the hunter to take more care in choosing his shot so as to avoid killing calves and obtain better meat in barren fat cows and adult males. The second restriction would allow arbitrary closing of the season in years of early storms and preclude hunting on the winter ranges.

Illegal Hunting: Illegal hunting occurs mainly for three purposes: (1) For meat out of season. (2) For teeth and heads, and (3) For trap bait. The first is usually done by ranchmen or irresponsible settlers that desire fresh meat in summer and look upon the game as a local asset to be drawn upon at any time of the year. This loss is extremely difficult to prevent under the most favorable circumstances and practically impossible under present conditions. Many of the State Deputy Game Wardens have local interests, and some have violated the game laws prior to appointment. These conditions prevent proper enforcement of the State laws and result in almost total disregard of this class of violation. A practical remedy here would be the appointment of Game Wardens without local interests, under a competetive Civil Service, rather than a political system.

Teeth and Head Hunting: This class is the most vicious and wanton of all violaters. It is made up of professional poachers that are drawn to any locality where game abounds and that make a profession of killing game animals for their hides, teeth, heads and furs. The loss from this source is enormous and seems to go unchecked from year to year. Those engaged in this work are sly, hardy men that think nothing of taking long trips on snowshoes through the mountains, carrying only the bare necessities of life. They are very successful in eluding the game wardens and are not easily convicted if caught, unless the evidence is well gathered. It is common knowledge that certain persons are doing this work in Jackson's Hole

nd it seems a standing joke that the game wardens do not catch them. Heavy penalties and more vigorous methods are needed to stop this practice.

Bait Hunting: Hunting for bait occurs, to a limited extent, but the gradual decrease of fur bearing animals and more scientific knowledge in wolf and coyote trapping by the use of scents has reduced this class of hunting and will soon eliminate it altogether.

Supervisor Miller, on the Teton National Forest, estimates the various losses in terms of percentage of herd in his 1914 report, as follows:

		Percent
Unpreventable--old age, etc.		8
"	accidents	2
"	wounds	6
Preventable-----starvation		5
"	predatory animals	5
"	hunting	6
"	miscellaneous	2
	Total,	34

These figures may be accepted for a comparative basis. It is clear that the relative percentage of numbers killed by hunting and wounds should be included together, since one results from the other. The total loss is here shown to be slightly more than one to three, and if other preventable losses are taken care of there will be a decided increase in the numbers available for hunting. From a resource basis it would appear then that effort should be made toward reducing the starvation, predatory animal and other losses so there will be a more liberal allowance of legitimate hunting for recreation, trophies, and food.

GUIDES.

A class of professional guides has sprung up around the borders of the elk

country who devote their time during the open season to taking parties into the mountains for hunting trips. In many cases these guides have ranches located in neighboring valleys where they occupy their time during the closed season in ranching and stock raising, or in some cases providing delightful summer camps for tourists and pleasure seekers. Each guide becomes a licensed game warden under bond and is required to enforce and uphold the game laws of the State, and as the permanence of their business depends upon the protection of game, they are usually advocates of wise laws and thorough enforcement. Many of them are also thorough sportsmen who take up the work for the love of it. The outside sportsmen, tourists and campers are commonly spoken of as 'dudes' and the guides and camp managers, in the vernacular of the cattle country, are 'dude-wranglers.'

Game Refuges.

The present system of game refuges is a menace to future elk protection, since those created by the State legislature are not permanent and are always subject to elimination, reduction, or renewal at the meeting of each legislature. Game refuges should be chosen with the object of game propagation and future supply. Permanency is the necessary requisite of a game refuge and this could best be attained through the establishment of permanent refuges on National forests where the land is better adapted to game than other purposes, and in other localities where the best hunting would result from the increase and overflow of the herds. In every case winter range must also be provided either on or off the National Forest.

Elk refuges are of two widely different types, one to provide winter range, the other summer range. As far as possible these ranges are left to the selection of the elk and are generally where experience has shown that satisfactory food and protection are available. This experience, however, does not take into account the unusually severe winters that occasionally occur and at times there have been heavy losses by starvation during long periods of deep snow. To obviate the recurrence

such losses in most congested parts of the elk winter range Congress authorized the purchase of an extensive hay ranch in the valley near the town of Jackson, Wyoming, in 1912, and its maintenance under the administration of the Biological Survey. This ranch includes about 500 acres of meadow swamp and hay land and about an equal area of upland slopes where there is good winter grazing for the large herds of elk that have always occupied that region in winter. Under present conditions the ranch yields about 500 tons of hay a year, but this can be materially increased by improving the hay land and increasing the area of alfalfa, clover and tame hay at the expense of marsh grass. The outside grazing can also be greatly increased by fencing to protect it from encroachment of local stock during the summer. As there is no occasion for feeding the elk in mild winters the hay accumulates until there is a good supply for the time of real need. There is at the end of the harvest in 1915, two years of accumulation of hay, or nearly 1000 tons, in readiness for the winter and this amount should be maintained as a minimum supply for possible need. On previous severe winters hay has been bought by the Federal Government and the State and fed to the elk, but the supply has been uncertain and not available until many elk had perished. Under the present arrangement it is hoped that practically all loss can be prevented within reach of the hay ranch, yet a very severe winter would undoubtedly cause considerable mortality among scattered bands of elk in the outlying valleys.

Lands

To provide for a permanent herd of elk certain winter ranges are very necessary and should be retained intact for use at that period of the year. That intelligent action may be taken in giving consideration to the value of these areas for elk winter range, each stream valley that has a bearing on the question will be considered separately, and, as far as possible at this time, definite recommendations given. The ultimate value of many areas will need to be determined by a winter

reconnaissance, that the actually used and needed lands may be designated. Until such reconnaissance is made, it is recommended that listment be withheld for those areas designated herein.

Wind River

On the Washakie Forest, practically all of the winter range that has been used by elk in the recent past occurs along the upper Wind River from the mouth of Du Noir to approximately the upper Burlingham ranch. A considerable portion of this area lies outside the National Forest boundary and is heavily grazed by local stock. This eliminates from consideration some very suitable winter range on public domain that, due to its long usage by cattlemen, would cause considerable conflict. From the Forest boundary north and west, to the Burlingham ranch, there occurs a warm southern exposure on the ridge between Long Creek and Wind River, supplemented by broken willow bottoms along the river. The more level areas have already been alienated, some for 25 years, yet practically no cultivation occurs. The bottom lands are broken by gullies, beaver dams, and streams and are covered with willow patches and swamp grass. As is well known, these willows provide an important part of elk winter browse and have a value comparable to that of the steeper grassy sidehills. It is recommended that all of Sections 16, 17, 18, 19, 20, 21, 27, 28, 29, 33, and 34 of Townships 43 N., R. 109 W., 6th P.M., be held as having a higher value for winter range, to provide and perpetuate range for approximately 1000 elk. Probably 90 per cent of these sections are too rough for cultivation.

Green River

It has already been requested, of the local classification head, that consideration be given the lands above the Roaring Fork and below the Green River Lakes on their value for winter elk range. This area consists principally of a broken sidehill with southern exposure and narrow willow and sedge bottoms along the Green

ver and side streams. It provides range in winter for over 1500 elk, and has always been considered, in local administration, as valuable for this purpose. Two alienations occur, known as the Osborn ranches, neither producing an appreciable amount of hay, although having been alienated for some 20 years. Their present use is headquarters for stockmen in summer. It is evident that the level grassy parks along the north side of the Green River have as high a value for winter range as the more rugged sidehills, and that little or no injury will result if these lands are withheld from listment. The area includes all of that portion of the Bridger National Forest on upper Green River, bounded by the divide between Green River and Gypsum Creek on the south, Roaring Fork on the west and north, and the Continental Divide on the south and east, as indicated on the map. This tract is locally known as the Roaring Fork Grazing Division.

ros Ventre River

Additional examination is necessary on the Gros Ventre before specific areas can be recommended. Prior to such a winter examination, the lands as indicated herein should be withheld from listment. All lands north of the Gros Ventre River to crest of ridge with southern exposure between Gros Ventre and Bacon creeks, and from mouth of Fish Creek to mouth of Hackamore Creek. All lands on Cottonwood, Breakneck, Dry Cottonwood, and Slate creeks. Natural topographic features will prevent other desirable lands along the north side of Gros Ventre from being alienated.

Flat Creek and Tributaries

A strip of land within the present boundary of the Forest east of the main Jackson Hole should be reserved for trail and winter range purposes. These lands re generally open sidehills with little grazing or timber value. They are especially valuable for maintaining an unrestricted trail from the summer elk range to the wintering grounds near the Jackson elk ranch in the southern part of the main valley.

er Snake River and Tributaries

Lands east of the Range line between Ranges 115 and 116 W., in Townships 39 and 40 N., 6th P.M., should be temporarily withheld from listment, until definite recommendation can be given on winter use.

The accompanying map indicates the approximate boundaries of the lands now considered as being of value for winter range or trail purposes. Other areas may appear upon winter examination that will be valuable for elk winter range.

Special Uses

No present special uses conflict in any way with the elk situation. It is recommended that care be taken in granting special use permits for pastures and stockmen's uses, until the lines of desired winter refuges be established. This can be restricted to the areas held for examination of listability.

blic Lands

Along the west boundary of the Teton Forest from approximately the point of intersection with the Gros Ventre River to Jackson, there is a strip of public domain adjacent to the Forest that is very necessary for unrestricted trailing of elk. The map indicates the present encroachment of alienations toward the Forest boundary here, and the comparatively narrow strip remaining. This strip is fast being alienated for pasture purposes, since it occurs on valuable, open sidehills, outside the Forest. It is recommended that action should be taken to have the remaining land withheld from private ownership, and set aside for use of elk in passing to and from their winter range.

Administrative Sites

To provide for subsidiary elk ranches, in outlying valleys it may seem desirable at areas of cultivable lands be withdrawn for the purpose of raising hay for winter feed. As it is difficult to purchase private lands it seems especially desirable to

rove Government owned lands for this purpose. Several very suitable areas occur at strategic points along the different streams and such areas can be definitely recommended if this course is decided upon after the winter examination.

Game Laws

Two conditions stand out in the present system of game protection that should be remedied. One is the non-uniformity of the State Laws of Montana, Idaho, and Wyoming, and the second is the local influences that are apparent in the framing of the individual State laws. The most serious feature of the interstate condition is the diversity of seasons and license for hunting. The elk season in Wyoming is from September 1 to November 15. In Montana from October 1 to December 15, and in Idaho from September 1 to January 1. The reasons for these seasons are obvious. Wyoming, including the Yellowstone Park, provides practically all of the elk summer nge. This is due to the encroachment of stock, particularly sheep, onto the summer ranges in Montana and Idaho and consequent loss of big game and the location of the protected National Park area that offers them refuge. State jealousy and local feeling naturally influence legislation to provide hunting under resident license and accordingly the seasons of Montana have been extended that hunting of elk can occur after they have been driven out of the Park by snow, onto their natural and available winter range. The Idaho situation is identical except that now fewer elk drift from the National Park or Teton State Game Preserve. Some elk drift west from the Pitchstone plateau onto Falls River and its lower tributaries. These elk must leave the Park ranges early in December and the late Idaho elk season allows them to be hunted on their winter range. While for obvious reasons the present drift into Idaho is small, it provides, under present conditions, for legalized unting at too late a date, and on the winter ranges where the elk should be pro-cted. To remedy this situation, action by the States concerned should be taken toward uniform State laws and close cooperation with officers of the Forest Service

o are in a position to render substantial aid in protecting game on the National forests.

Summarizing, the game laws should be amended to provide for:

1. Uniformity of hunting seasons and license in the three States adjoining the Yellowstone National Park.

2. A resident license fee somewhat commensurate with the value of the game animal for food.

3. Shortening of the open season at the latter end to prevent hunting on winter grounds, and opening not earlier than September 15th, to prevent loss of meat from warm weather and loss of nursing calves.

4. Giving arbitrary powers to the State Game Warden, State Game Commission or Federal Government to limit the open season in emergency.

5. Appointment of Game Wardens under competitive State or Federal Civil Service examinations and elimination of political appointments.

6. Issuance of hunting licenses by the game wardens based upon certain qualifications of the licensee in responsibility and ownership of taxable property.

7. Issuance of only that number of licenses that will remove the estimated number available for killing.

Recommendation 5 is made to remedy one of the worst features of the present protective scheme. Local people under appointment as game wardens usually have local interests in the community and often fail to enforce the law. For effective enforcement, well-chosen civil service employees without local interest would more effectively carry out the intent of the law.

ADMINISTRATION.

<u>ston Forest</u>

It is strongly recommended that the basis of the grazing plan on this Forest be the consideration of the maximum herd of elk, in assignment of range for winter

, upon an equal plane with the summer grazing of domestic stock. In other words, the elk should be granted ranges that they can and should use in winter and conflicting domestic stock be assigned to ranges that are purely or partially elk summer grounds. This consideration can be given, without conflict between the two governing factors, on account of the great area of unused or partially used ranges upon the Forest. Topographically the Teton Forest is mainly dependent upon Jackson Hole for its grazing use. Encroachment from Green River owners occurs to some extent in the Hoback Basin and upon the headwaters of Gros Ventre, Bacon and Fish creeks, while 20,000 head of Star Valley owned sheep have been assigned range on the southern end of the Forest. These outside grazing privileges upon the Forest should be held to their present use of the range, and unutilized range saved for the increase of stock that is bound to occur in Jackson Hole. The Jackson Hole Valley is entirely surrounded by the Teton Forest and no plan should contemplate the restriction of grazing by these cal people by allowing encroachment by outside owned stock. It is estimated that Jackson Hole is at present 50 per cent under cultivation and that more intensive methods of farming will eventually produce a 50 per cent increase in crops. The present number of stock locally owned and dependent upon the National Forest is approximately 9000 head. Assuming full development, this herd would be increased to 27,000 head, but allowing for additional feeding under more intense methods, it is probable that the locality will never produce more than 25,000 head of cattle. This, then, is the approximate number that must ultimately be taken care of on the Forest for summer range. It is estimated that the Teton Forest if fully stocked to cattle, horses and sheep, and without consideration of the elk, would furnish forage for 25,000 head of cattle and 250,000 head of sheep (estimate of Supervisor Miller.) It is readily apparent then that if no further encroachment of sheep is allowed, there ll always be sufficient range for the locally produced cattle, the present outside owned cattle, and the present permitted 20,000 sheep, without conflict with the maximum herd of elk. The elk summer range is mainly unfitted for cattle but suitable for

keep. In spring and fall they cross the ranges that cattle should be assigned to, creating a give and take proposition that is fair to both classes, since the elk, being ahead of the cattle, get the first grass in the spring, while the cattle get the best forage in fall as they drift or are taken out. The real problem is therefore the conflict in use of elk winter range by cattle in summer, and since there is a great surplus of range in the aggregate, the following plan is proposed:

Upon definite information secured by winter observation upon the ranges actually used by elk in winter, areas so suited be set aside for the exclusive use of the elk. That cattle using such ranges be assigned to higher or non-conflicting areas. That definite plans of protection of closed areas be formulated and that needed or necessary drift fences be constructed by the Federal or State Government to protect such areas. That a Grazing Plan for the Forest be formulated definitely defining the division of the range between the two classes and that such plan also forecast the use of summer elk ranges by domestic stock, in that the summer situation may also be placed upon a permanent basis. That special consideration be given the present Teton State Game Preserve in the allotment of ranges, but that suitable non-conflicting cattle ranges within this Preserve be opened to the grazing of domestic stock. That necessary and needed driveways across elk winter range be designated and allowed for the proper handling of stock, and that the period allowed in crossing on such driveways be specified in the permits.

Such areas as need to be set aside will occur on Buffalo, Spread, Gros Ventre, Flat, Trail, and Horse creeks and Hoback River with their tributaries and should be only of sufficient size to attain the end for which needed, may be of any number necessary and should be picked out with the view of easy administration and protection. If possible, such areas should be set aside as permanent game refuges upon which hunting of all kinds is prohibited. These recommendations call for action on the part of the local Forest Service administration in perfecting their details,

at should be outlined and as definitely decided upon by the cooperative investigators as their limited winter examination will allow.

In contemplating and planning the future use of areas for domestic stock summer range, defined boundaries are as necessary as in the winter ranges, in that future conflict will be obviated if such lines are locally known. The present sheep range on the Teton should not be increased as long as the present herd of game is maintained. The present sheep line was established last year, the sheep having been cut back from one to three miles on Martin, Willow and Cliff Creeks to provide range for about 1500 elk that summer in that locality. On the area closed this year numerous elk were seen while it was also being used by cattle, indicating that it can and is used by other classes of stock and game. This area has little winter value but should remain closed, as at present, to sheep grazing for the use of summer cattle and elk grazing, and the points of the high Cliff Creek and Willow Creek ridges should be withdrawn from sheep grazing back about two miles from the present boundary, to provide summer range for the elk in fly time.

Bridger Forest

Only one area need be considered on the Bridger Forest. This area is located above the Big Bend on Green River between Roaring Fork and the main Green River. It is the natural and formerly used winter range of from 1000 to 2500 head of elk and the most suitable of any range in the upper Green River. It is now being grazed more or less indiscriminately by the cattle permitted above the Rock Creek drift fence on Green River, and while it is planned to allow not to exceed 400 head upon it, there were approximately 500 counted on September 6. Obviously the drift of stock can not be controlled unless certain drift or division fences are constructed to prevent use of this range. And in order to provide for winter feed for the elk in this locality it is imperative that grazing be prohibited above the mouth of Roaring Fork along the north side of Green River. Two ranches, known locally as

he Osborn Ranches, and onwed by a Mr. Luman, are located within this area but neither appears commensurate to any large number of stock and it is doubtful if 25 tons of hay are produced. Since Mr. Luman has a permit for a large portion of the Upper Green River range, the transfer of his stock to other nearby ranges seems feasible and a 400 decrease in a range running 7000 head is comparatively small when the object is to provide winter range for some 2000 elk. Permitted on the Roaring Fork range are ordinarily 240 head of stock, but this number has been considerably augmented by natural drift from the Upper Green River range and certain conditions this spring tended to increase the number normally grazed above the Rock Creek drift fence on the Upper Green River to about 8000 or 9000 head, these stock having gone through the broken fence from the Gypsum Creek range. This area should be reserved entirely for winter elk range to provide for the elk summering on the head of Gypsum Creek, Upper Roaring Fork and Green River. The construction cost of the fence should be met entirely by the Government or State. It is estimated that four miles of fence will protect the area from trespass. This area is now included in the Bridger Forest Game Refuge and is given absolute protection from hunting that will tend toward an augmented herd of elk on Green River, if properly provided for in winter.

Shoshone Forest

The situation on the Shoshone Forest is very favorable if the present system of game refuges and grazing administration is carried out, and permanency of the refuges will most likely provide a considerable herd of elk on this Forest.

Absaroka Forest

The strip reserved from domestic grazing on this Forest between the Jardine and Slough Creek Trail and the northern boundary of the Yellowstone National Park is of little value for grazing. It is mainly dense forest with sparse surface vegetation. It contains very little winter range for elk and is not sufficiently

levated for good summer range except on points of two high ridges that enter it. It supports a few elk in summer, affords a little good hunting in the open season, and provides pasture for campers' horses.

The most valuable winter elk range is the public domain north of Gardiner and the remaining public land here should be withdrawn as a game refuge and all hunting prohibited. At present these lands provide a most perfect trap for killing elk on their winter range, and either the lands should be held for game refuge purposes or the Park fence continued east on the Park line to prevent elk from crossing the Yellowstone into this death trap.

Gallatin Forest

A large number of elk winter in the valley of the West Gallatin and a comparatively small number summer in the mountains east and west of the valley on parts of the forest that have been withheld from sheep grazing. This number in summer is at present small for the area withheld, yet it might be increased by protection until this part of the State would provide a considerable amount of excellent legitimate hunting. The present limited number of cattle and horses permitted in the valley do not noticeably affect the winter grazing, but the number should not be increased as the forage of the valley and lower slopes is of vital importance to the present herds of elk wintering there. It is not needed for local stock and the only conflict is between use for elk and other game and outside stock that could be brought in for summer range.

Madison Forest

Nothing definite is known of the elk winter range in the Madison Forest and it is recommended that no change in present policy be made until after the winter examination, since it is understood that about 1200 elk winter here.

TRAILS.

The main Jackson Hole herd summers in the Teton State Game Preserve and in the Yellowstone National Park, as indicated on the map. These elk have a more or less definite trail to their winter range. They migrate from their summer range across Spread Creek to the vicinity of Mt. Leidy; cross a low divide onto Slate Creek and then follow the bare southern exposures of the Slate and Gros Ventre to the aspen, sagebrush foothills bordering the Gros Ventre Flats. To this point the trail is unrestricted and many elk remain along the Gros Ventre for the winter. The Valley herd, however, must from here follow the foothills to the Jackson Elk Ranch in the big swamp above Jackson. Formerly the country between the Gros Ventre and Flat Creek was open, but dry farms have so restricted the trail that the elk are now forced to follow the foothills east of the main floor of the "Hole." Here the Forest boundary cuts high on the slope and a strip approximately a mile in width, that is necessary for free trailing, is outside the Forest and on the public domain. This strip is rapidly being alienated for pasture purposes under various land acts and immediate action should be taken to preserve the remaining public domain for the unrestricted trailing of the elk to the Jackson Elk Ranch and the lower Jackson Hole winter range. This strip is indicated on the map and shows the present encroachment of alienations toward the Forest boundary. Furthermore, no tracts should be listed within the Forest along this boundary nor should any eliminations be made unless secured for the elk by established refuge for trail purposes. The land involved is treeless sidehills, too steep and rocky for cultivation and mainly valuable for pasture purposes.

Status of Present Range Used by Domestic Stock

From those areas designated, by intensive study and examination in the field in winter, as elk winter ranges, cattle and stock of all kinds should be prohibited except for necessary trails to reach allotted ranges in spring and return in fall,

d for campers' horses along the trails and roads. Such restrictions will affect 240 head of cattle on the Roaring Fork area on Green River, a portion of 592 cattle on Spread Creek, 1584 cattle on Gros Ventre River, and 854 cattle on Lower Hoback River, and a few on the Gallatin River. Definite boundaries and figures on the stock affected can not be given until the actual needs of the elk for winter range have been determined, but the conflict is only partial and adjacent range used by elk in summer only, or unused by either class, occurs in surplus of any present or future need, allowing a distribution of stock and elk without difficulty. The Hoback Basin on the upper part of the Hoback River is apparently fully stocked to cattle owned by Green River people. Very few elk summer or winter in the main basin. This stocking occurs as far down the river as Cliff Creek. On Cliff Creek, since the sheep have been restricted, there occurs considerable summer range that is suitable or cattle grazing. This range should be stocked with cattle to the relief of winter range for elk along lower Hoback River. The Upper Green River is fully stocked to cattle and any increases will have to be made at the expense of range on Bacon and Fish creeks in the Teton Forest. Lower Bacon Creek is good cattle range that can be used by Teton permittees to the relief of the ideal winter elk range on lower Fish Creek, Cottonwood and Breakneck creeks. It is recommended that no further encroachment of Green River or Bridger cattle be allowed upon the Teton Forest and that only the present upper Fish Creek range as developed by natural boundaries be allotted to Bridger cattle. Generally, the cattle on Gros Ventre should be confined to the south side of the river, leaving the southern exposure for winter elk range and trailing.

RAILROADS.

Railroad construction into Jackson Hole would be harmless but useless. There s no real reason for a railroad being built into the country except as a portion of a through line, as the traffic for a branch spur would not warrant the expense of

onstruction. A through line would very likely enter the southernmost portion of the valley and cause no more disturbance to game conditions than the present Victor branch of the Oregon Short Line. It would bring in more hunters and necessitate more thorough protection of the game, but good wagon and automobile roads are now having this effect and a railroad would add little to the influx.

CONCLUSIONS.

To perpetuate the elk herds in the Yellowstone Park region and provide a reasonable amount of permanent and profitable hunting it is necessary that the elk be considered a national resource and that close cooperation between the several States and the Federal government be arranged to provide wise and uniform legislation for their control. The details of such a plan should provide for concerted efforts in all matters relating to protection of the elk on a practical basis of returns in recreation and sportsmanship for all citizens of the nation and in revenues to the States.

As a result of the summer examination it has been shown that:

1. A winter examination is necessary to secure a reliable census, determine the maximum herd to be perpetuated, the amount of winter range available, and to plan a more practical distribution.

2. Suitable winter ranges should be retained exclusively for the use of elk.

3. There is an ample supply of good summer range.

4. "Scabby bulls" and ticks should be further investigated.

5. The organized campaign against predatory animals should be continued and dogs allowed for use under special permit in hunting mountain lions.

6. Game refuges should be established on all winter ranges and continuous study given to the establishment of refuges that the greatest good to the game resources will result. The Biological Survey Elk Ranch at Jackson should be maintained and extended.

7. The protective features should include provisions for the uniformity of seasons and licenses in the States surrounding the Yellowstone Park; limits of bag and number of licenses under a plan of management based upon the maximum herd; a resident hunting license commensurate with the food value of the game; the closure of the hunting season in emergency by executive action; appointment of protective officers under competitive Civil Service examinations and issuance of resident license to responsible and taxable persons only.

8. Public lands needed for winter range and trail purposes should be reserved and no listments should be made within the National Forests in areas set aside for elk winter refuges.